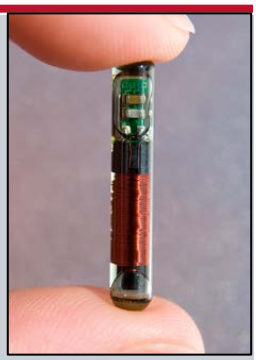
Weatherford®

REAL RESULTS

RFID Advanced Reservoir Management System Optimizes Injection in Well Design, Improves Reservoir Management



The RFID device enhances standalone tools and complex integrated completion systems by introducing intelligence to tools such as fracture sleeves, packers, and ICDs. RFID technology enables operators to deploy openhole completions without washpipe integrity issues while maintaining full circulation capability. The need for expensive, time-consuming communication systems or well intervention is eliminated.

Objectives

- Deploy an openhole completion in a long-reach horizontal (19,685 ft/6000 m) water-alternating-gas (WAG) injection well.
- Isolate six discreet zones in the open hole.
- Distribute 35 mmscf (30 mbd) gas water injection evenly across one of the reservoir units.
- Stimulate injectivity without creating extensive thermal fractures.
- Deploy completion without use of washpipe, intervention, or control lines.

Results

- Weatherford deployed the Advanced Reservoir Management System (ARMS℠) with radio frequency identification (RFID) technology to optimize production by effectively fracturing, stimulating, and balancing the flow regime from toe to heel. The system included the following:
  - Fluid-displacement devices: RFID-operated fracture sleeves and a fall-through flapper valve eliminated the need for a deep-set plug when setting the packer, reducing completion time and risk.
  - Zonal-isolation device: Cup zonal-isolation (CZI) packer, a hydrostatically set deployed-cup system incorporating the Weatherford open hole ROKANKOR® system, which is reactive to changing well conditions caused by changing differential, thermal changes, wellbore collapse, and expansion.
  - Stimulation devices: Fracture sleeves using RFID tags enabled rigless intervention by sequentially opening and closing via RFID tags.
  - Zonal-control devices: RFID-enabled inflow-control devices (ICD) with FloReg™ screens enabled the even distribution of injected media, improving the overall efficiency of the WAG injection and, consequently boosting production.

Location
ULA Field, Norway

Well Type
Offshore, extended horizontal injector

Maximum Temperature
302°F (150°C)

Maximum Hyrdostatic pressure
7,500 psi (51.7 MPa)

Maximum Applied Pressure
7,500 psi (51.7 MPa)

Formation Pressure
7,000 psi (48.2 MPa)

Depth
19,685 ft, 6000 m
(more than 3,280 ft/1000 m horizontal)

Products/Services
- *ARMS*
- RFID tags
- RFID-operated fracture sleeves
- Fall-through flapper valve
- CZI packers
- *FloReg* screens
- *ROKANKOR* system

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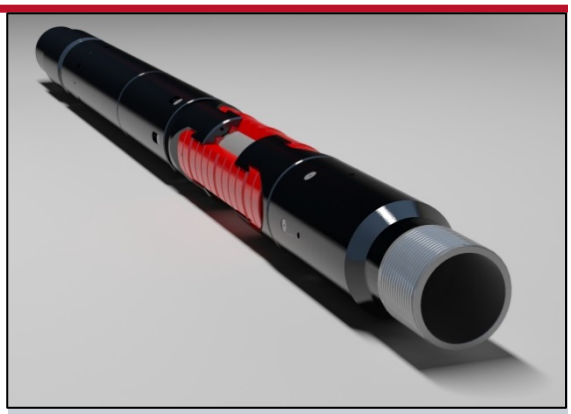
Results, cont.

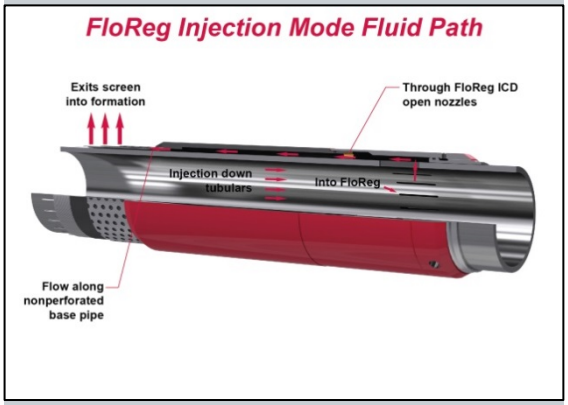
- The *ARMS* system was successfully installed and established individual injectivity into each zone.
- Well intervention and a caliper run confirmed all ICDs were open and all fracture sleeves in zones 2 through 6 were closed, as expected.

Value to Client

- Using Weatherford's *ARMS* suite of tools enabled the operator to install a complete reservoir-management system activated by RFID technology, providing multiple activations and deactivations on demand.
- The flow splitting with the operator-established rates was achieved 6 months after the installation.
- After a year, confirmation of operator-established rates per zone was achieved, and zonal isolation integrity remains.



Weatherford's patented openhole *ROKANKOR* system is an innovative design that uses six mechanical slips to grip the formation with limited penetration, minimizing fracture damage in the immediate contact area during the setting event.



Weatherford's *FloReg* ICD provides uniform inflow distribution in horizontal and deviated wellbores and reduces water or gas production for more efficient reservoir drainage.

